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SUSAN H. ROSENAU

June 29, 1993

OUR FILE NO.
1049-101-63

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Re: PR Docket No. 93-61/RM No. 8013
Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems

Dear Mr. Caton:

Submitted on behalf of Radian Corporation, is its **COMMENTS** in the above-referenced proceeding. Enclosed are an original and nine copies, a copy for each Commissioner.

If there are any questions concerning this matter, please communicate directly with this office.

Respectfully submitted,

RADIAN CORPORATION

James E. Dunstan
Susan H. Rosenau
Its Attorneys

SHR/lgs

Enclosures (10)

No. of Copies rec'd 0+9
List A B C D E

Before The

Federal Communications Commission

Washington, D.C. 20554

In The Matter Of	)	
	)	
Amendment of Part 90 of the	)	PR Docket No. 93-61
Commission's Rules to Adopt	)	RM-8013
Regulations for Automatic	)	
Vehicle Monitoring Systems	)	

TO: The Commission

COMMENTS OF RADIAN CORPORATION

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June 29, 1993

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SUMMARY

Radian Corporation, a Dallas-based scientific research and consulting firm, supports the allocation of spectrum in the 900 MHz band both for Location and Monitoring Service ("LMS") systems and for Wind Profiler Radar Systems ("Wind Profilers"). Both LMS and Wind Profilers have developed into commercially mature technologies over the past ten to twenty years. Wind Profilers, an outgrowth of Doppler radar studies of the ionosphere, have many beneficial uses, the most significant of which appear to be weather forecasting and environmental assessment. High frequency systems, which operate at much lower power levels, are useful for high resolution lower atmosphere profiles. A great demand for this valuable environmental technology exists, and Radian's allocation request is supported by State and Federal environmental concerns, as well as the private sector.

Both allocations are necessary and compatible. It is unlikely that 915 MHz Wind Profilers will interfere with other users of the band. 915 MHz Wind Profilers have been operated across the nation, often in urban and populated areas where ISM devices, Amateur Radio operators, and developmental AVMS systems sharing the band are likely to be operating. 915 MHz Wind Profilers have an outstanding record of non-interference to other band users. This is due to the low power levels, side lobe suppression fences, and other operational characteristics of 915 MHz Wind Profilers. No commenter has made any valid showing to the contrary.

Radian supports the FCC's proposed division of the 902 - 928 MHz band for LMS systems. The division promotes the effective sharing of spectrum among all users of the band.

The public interest will best be served by contemporaneous

Before The

On May 28, 1992, North American Teletrac and Location Technologies, Inc. filed a Petition for Rulemaking seeking the adoption of permanent AVM rules which resulted in the issuance of the subject NPRM. Notice of Proposed Rulemaking, PR Docket No. 93-61 (Document No. FCC 93-141), Released April 9, 1993 ("AVM NPRM"), ¶1 n.3. In the AVM NPRM, the Commission explained that both wide band and narrow band AVM systems currently exist. The Commission further expressed its view that the division of the spectrum between wide band and narrow band applications requires additional evaluation, but concluded that the demand for AVM services warranted the adoption of permanent rules which leave room for further development. *Id.* at ¶¶4-5. The Commission also re-named the service "the Location and Monitoring Service" or LMS. *Id.* at ¶9.

2. Wind Profiler Procedural History

Wind Profiler Radar Systems ("Wind Profilers") using the 915 MHz band have been in operation pursuant to government or FCC experimental authorizations for over a decade. Government experimental use of 915 MHz Wind Profilers was first approved in 1979. Reply Comments and Amended Petition for Rule Making of Radian Corporation, RM 8092, ("Radian Reply"), Appendix C at 2. Since 1989, Radian and the United States National Oceanic and Aeronautic Administration ("NOAA") have jointly pursued the development of 915 MHz Wind Profilers. *Id.*, Appendix A at 1-2. In 1992, NOAA sought permanent approval of the allocation for government operated 915 MHz Wind Profilers, while Radian pursued non-governmental and commercial accommodation at 915 MHz.

On April 1, 1993, the Commission issued a Notice of Proposed Rule Making/Notice of Inquiry in ET Docket No. 93-59 ("Wind Profiler NPRM/NOI"), concerning the allocation of spectrum for Wind Profilers. The Wind Profiler proceeding combines in a single proceeding two separate frequency allocation matters. The first stems from NTIA's request, dated January 17, 1992, that the FCC allocate frequencies in the 449 MHz band for Wind Profiler operation.

The second facet of the Wind Profiler proceeding stems from Radian's Petition for Rule Making ("Petition"), dated August 13, 1992. Radian, a scientific research and consulting firm based in Austin, Texas, filed a Petition requesting the allocation of frequencies in the 915 MHz range for the use of lower-atmosphere Wind Profilers. The Commission issued Public Notice of Radian's petition on October 1, 1992 (Report No. 1909 (Oct. 1, 1992)), requesting comments.[1]

The Commission chose to address both allocation requests in a single proceeding. Comments were filed on June 15, 1993, and reply comments are due on July 15, 1993. Attached hereto as Exhibit A is a copy of the Comments filed by Radian in ET Docket 93-59 ("Radian Comments in ET Docket 93-59").

B. Development of LMS Technology

In its Notice of Proposed Rule Making for LMS Systems, the Commission has proposed the following definition of LMS:

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[1]On December 17, 1992, Radian filed its Reply Comments, and on December 18, 1992 filed an Erratum to its Reply Comments and Amended Petition for Rule Making ("Radian Erratum"). Several other parties filed comments or reply comments, some of which are discussed *infra*.

> The use of non-voice signalling methods from and to radio units to make known the location of such units. LMS systems may also transmit and receive status and instructional messages related to the units involved.

AVM NPRM at ¶9. Over the past twenty years, a variety of LMS systems having various operating characteristics and disparate uses have been in development, including wide-band pulse-ranging multilateration systems, narrow band systems, and proximity sensing. *Report and Order*, 30 R.R.2d at 1668-69. Their primary use has been to locate vehicles, but research and demand have expanded that capability to

energy returned to earth, which can then be analyzed, providing highly accurate meteorological data on a real-time basis. *Id.* at 7.

As described in Podion's Petition, the basic components of a

LAP™-3000 operates at 915 MHz. Since 1989, Radian has operated the LAP™-3000 at 915 MHz under experimental authorizations at numerous locations in the United States, which include many highly populated urban areas. Radian Erratum in ET Docket No. 93-59, Engineering Statement of John Neuschaefer at 1.

There can be no question that 915 MHz Wind Profilers perform a useful and unique service. Wind Profilers at 915 MHz are pivotal to air-quality and environmental research projects such as the Lake Michigan Ozone Study, for which Radian provided 915 MHz Wind Profilers under experimental authorizations. *See* Appendix A, *supra,* Supplemental Engineering Statement of John Neuschaefer in ET Docket No. 93-59 at 2; *see also* Petition at 2 and at Appendix D.

As explained in greater detail in Appendix A, Radian's June 15, 1993 Comments in ET Docket No. 93-59, 915 MHz Wind Profilers are peculiarly suited to environmental uses. They are transportable, economical, and operate at low power levels, yet yield the most accurate data for the relevant part of the lower atmosphere at high resolution. Appendix A at 6 and at Exhibit 1 thereto. State and Federal environmental authorities, including the U.S. Environmental Protection Agency, the Houston Regional Monitoring Corporation, the Texas Air Control Board, the South Coast Air Quality Management District, and many private entities and educational institutions have expressed their support and an increasing demand for high-frequency wind profiler studies.[3]

[3]The exhibits to Radian's June 15, 1993 Comments in ET Docket No. 93-59 (Appendix A hereto) include a letter from the South Coast Air Quality Management District to the Commission, describing the usefulness of 915 MHz Wind Profilers in its mission

Some important environmental studies which have utilized the 915 MHz Wind Profiler include:

- The Lake Michigan Ozone Study (Radian Wind Profiler Petition, Appendix D);
- A study of the effect of the Salt River Project's Navaho Generating Station in Northern Arizona on visibility in the Grand Canyon (Radian Wind Profiler Petition, Appendices E, G);
- The San Joaquin Valley Air Quality Study (Radian Wind Profiler Petition, Appendices F, G);
- The 1990 Rural Ozone in the Southern Environment (ROSE I) study in Alabama (Radian Wind Profiler Petition, Appendix G); and
- Study of large-scale drainage winds for the Department of Energy along the Colorado Front Range (Radian Wind Profiler Petition, Appendix G).

It is beyond dispute that air quality and the environment must be treated as issues of the highest priority. Twenty years of efforts have been unable to bring under control the effects of air pollution, acid rain and increased ozone levels, the effects of which are keenly apparent today. As described in the Senate Report regarding the 1990 amendments to the Clean Air Act:

> Although most areas of the country were to have attained the standards for ozone and carbon monoxide by 1983, in 1989, over half of the population of the United States is still exposed to levels of air pollution considered unhealthful by the Environmental Protection Agency and medical researchers.

(Exhibit 2), a letter to the Commission from the National Center of Atmospheric Research ("NCAR"), supporting Radian's Petition and describing its uses of 915 MHz Wind Profilers (Exhibit 3), and a memorandum from Professor Dennis W. Thomson of the College of Earth and Mineral Sciences of Pennsylvania State University, describing the system's academic and research value (Exhibit 4).

New and disturbing evidence on the health effects of ozone and carbon monoxide indicates that the current standards may not be adequate to protect the public health.

* * * *

A Harvard researcher testified before the Subcommittee [on Environmental Protection] that "In every epidemiologic investigation that we have performed over the past 6 years, we have repeatedly found a 2 to 5 percent air pollution effect on human mortality and morbidity. . . . In a separate study, the past President of the American Public Health Association found that ". . . air pollution is one of the greatest risks to public health in the United States[. . . .] If further Congressional action, or voluntary action by polluters, is not taken to reduce human exposure to a broad range of toxic air pollutants, then we can expect substantial increases in the incidence of air-pollution provoked disease, dysfunction, and premature deaths. A two to three fold (at least) increase or

II. RADIAN DOES NOT OPPOSE ALLOCATION OF SPECTRUM TO LMS SYSTEMS

Radian does not oppose the allocation of spectrum to LMS systems. LMS systems offer a great number of potentially beneficial services to the public. However, 915 MHz Wind Profilers also offer services, primarily environmental in character, which are of equal or greater importance to the public. These are described in Radian's June 15, 1993 Comments in ET Docket No. 93-59 (submitted herewith as Appendix A), as well as in Radian's original Wind Profiler Petition, and Radian's December 17, 1992 Reply Comments in ET Docket No. 93-59, all of which are incorporated by reference herein.

Radian vehemently opposes, however, the concept that an allocation for LMS precludes shared use of the 915 MHz band by other technologies, and in particular, by Wind Profilers. As shown below, the inherent operating characteristics of Wind Profilers make interference with LMS systems unlikely. No commenter in either proceeding has substantively or accurately challenged Radian's position on this point. In contrast, the operational history of 915 MHz Wind Profilers support's Radian's position that peaceful coexistence is possible. No commenter has to date presented any evidence challenging Radian's position that cooperative efforts can resolve any interference issues which arise. On this point, LMS systems, and not Radian, bear the burden of establishing that their use of the band should *exclude* other beneficial users. Clearly, the public interest is best served by maximizing the uses of spectrum, not by the creation of monopolies. In short, this proceeding, coupled with ET Docket 93-59, does not represent a zero-sum game. The Commission

need not choose a "winner" for this spectrum, but rather, should adopt rules which allow as many operators as possible within this band.[4]

III. WIND PROFILERS, LMS SYSTEMS AND EXISTING USERS OF THE 915 MHz BAND CAN PEACEFULLY COEXIST

A. The Operating Characteristics of 915 MHz Wind Profilers Minimize Interference

1. Vertical Pulsed Power

As Radian has explained in the Wind Profiler proceeding, Wind Profilers direct their pulses vertically, at or near the zenith angle, in a narrow beam. Radian Wind Profiler Petition at 3; Radian Reply in ET Docket No. 93-59 at 9; Appendix A at 10. The concept is simple and obvious. A narrow vertical beam is less likely to interfere with nearby operators on the same band because it *is* narrow, and therefore less likely to encounter the signals of nearby operators on the same band, especially where, as here, the other users of the spectrum are horizontal in character.

[4]Indeed, the 900-930 MHz region already is being shared by multiple users. The Federal Government is the primary operator in this band, and any permanent allocation for LMS must be secondary to governmental use. AVM NPRM, ¶10, n.24. Industrial, Scientific and Medical ("ISM") devices are primary users in this band, with a secondary allocation made for Amateur radio use, in addition to the developmental licenses previously granted for AVM users. Additionally, the FCC has previously determined that operations in the 900 MHz band were such that Part 15 low power devices could be accommodated subject to interference to and from other users. *Revision of Part 15*, 4 FCC Rcd. 3493, 3502 (1989). Finally, as detailed herein, Wind Profilers, both government and private, have operated at 915 MHz for over a decade without significant instances of interference.

2. Side Lobe Suppression Fences and Horizontal Attenuation

Side lobe suppression fences for horizontal attenuation go hand in hand with the vertical pulses of 915 MHz Wind Profilers to even further minimize potential for interference. The fences reduce what little side lobe energy may escape from the vertical pulsing of the high frequency Wind Profiler. Radian has proposed that these features be made mandatory. Radian Reply at 9; Radian Erratum, Appendix B.

3. Low Power Levels

All of the foregoing interference-minimizing features are further enhanced by the inherently low power levels employed by 915 MHz Wind Profilers. Unlike low-frequency (449 MHz) Wind Profilers which use 50,000 watts, 915 MHz Wind Profilers requires only 500 watts. As a result, the signal is weaker and therefore less likely to interfere with nearby LMS operations. Radian Reply in ET Docket No. 93-59 at 8-9; Appendix A at 10.

B. A Decade of Government And Private Developmental

National and Oceanic Atmospheric Administration ("NOAA") has operated a system at Denver's Stapleton International Airport since 1981. Other systems are in use at the Kennedy Space Center and White Sands Missile Center, as well as in urban locations in New York, California, Houston, Texas, Michigan, Alabama, Tennessee, Florida, Idaho, Colorado and Oklahoma. Radian Reply in ET Docket No. 93-59 at 7.

The Commission may take notice that many of these operations are located in regions where many users of adjacent spectrum -- including LMS systems -- are likely to be located. North American Teletrac and Location Technologies operate wide band pulse-ranging LMS systems nationwide, including cities where 915 MHz Wind Profilers are or have been in operations such as Houston, Los Angeles, and Chicago. Comments of North American Teletrac and Location Technologies, filed June 15, 1993, ET Docket No. 93-59, RM-8092 ("Teletrac WP Comments") at 2. Nonetheless, virtually no instances of interference have been reported. Even more significantly, no commenter in this proceeding or the Wind Profiler proceeding has cited a single instance of Wind Profiler interference with *any* user sharing the 915 MHz band. More than any theoretical explanation, the real-world successful operation of 915 MHz Wind Profilers corroborates Radian's claim that Wind Profilers and other users of the band can peacefully coexist.

C. No Party Has As Yet Made Any Cogent Showing That 915 MHz Wind Profilers Are, In Fact, Likely To Interfere With Other Users Of The Band

The only attempts to substantively address the potential for 915 MHz Wind Profilers to interfere with LMS systems have been made by:

- AMTECH Corporation (Comments of AMTECH Corporation, RM No. 8092, filed November 2, 1992 ("AMTECH WP Comments"));
- North American Teletrac and Location Technologies, *supra*;
- Hughes Aircraft Company (Comments of Hughes Aircraft Company, ET Docket No. 93-59, RM 8092, filed June 15, 1993 ("Hughes WP Comments"); and
- Pinpoint Communications, Inc. (Comments of Pinpoint Communications, Inc., ET Docket No. 93-59, RM 8092, filed June 15, 1993 ("Pinpoint WP Comments").

None of the foregoing raise any substantial interference issue. As explained in Radian's December 17, 1993 Reply Comments in ET Docket No. 93-59, AMTECH's analysis was fatally flawed due to miscalculations, mismeasurements and an erroneous assumption that 915 MHz Wind Profilers would operate at the same power levels and configuration as 449 MHz Wind Profilers. *See* Radian Reply in ET Docket No.93-59 at 8-9.

D. Radian Supports the Proposed Division of The 902-928 MHz Spectrum For LMS

As proposed by the Commission, the permanent LMS allocation would look as follows:

Frequency	LMS Use
902-904	Narrow Band LMS
904.375-904.625	Forward Links for 918-926 Wide Band LMS
904-912	Wide Band LMS
912-918	Narrow Band LMS
918-926	Wide Band LMS
924.890-925.140	Forward Links for 904-912 Wide Band LMS

AVM NPRM, ¶15. The major addition to the allocation from the developmental rules will be the requirement that the Forward Links be

located at the edge of the opposing wide band allocation, and the use of the 912-918 band for narrow band LMS operations.

The Commission's proposal appears to provide the greatest potential for development of LMS, especially in conjunction with Wind Profilers. Specifically, with the critical forward links of wide band LMS systems located approximately 4 MHz away from the edge of the proposed allocation for Wind Profilers (908.75-921.25), there is little chance for interference to wide band LMS operations. Additionally, narrow band LMS systems have been touted as being more interference tolerant,[5] and therefore their allocation to the 912-918 band, in the heart of 915 MHz Wind Profiler operations, would appear technically feasible. Radian would suggest, in order to minimize any potential interference, that LMS systems be licensed to the 902-904 MHz and 926-928 MHz bands first, with the 912-918 band licensed last. Such an allocation and licensing scheme also will allow for the further development of technology to make such systems as interference tolerant as possible both to Wind Profiler operations, but also to ISM equipment, centered at 915 MHz.

E. Radian Has Proposed Cooperative Efforts With Co-Secondary Users to Resolve Any Interference Problems Which May Arise, And Such Cooperation Can Be Mandated By FCC Rule

North American Teletrac stands alone among commenters in that it expressed some willingness to work with Radian to evaluate the compatibility of their respective systems. Teletrac WP Comments at 7.

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[5] "Some commenters operating and developing narrow-band systems claim that their systems are more robust than are wide-band systems and are therefore not as susceptible to interference." AVM NPRM, ¶ 25.

Although Radian disagrees with Teletrac regarding interference and bandwidth issues, Radian believes that such cooperation can resolve interference issues -- if any -- which may arise with respect to Wind Profilers, LMS systems and other users of the 915 MHz band, and strongly urges the Commission to require its licensees to participate in such efforts.

IV. LMS AND WIND PROFILER ALLOCATIONS SHOULD BE MADE CONTEMPORANEOUSLY

Radian's Comments in ET Docket No. 93-59 demonstrate that 915 MHz Wind Profilers have matured technically to the point where a permanent frequency allocation may be made. Appendix A at 11-12. Further, the market development is at the stage where a more permanent allocation is necessary for continued growth.

Market reaction to 915 MHz Wind Profilers has been excellent. Alan R. Thomas, the Director of the Environmental Research Laboratories at NOAA wrote to the Commission in support of Radian's proposals in ET Docket 93-59, stating that the "value [of 915 MHz Wind Profilers] in meteorological and climatological research and acid rain and air pollution studies was amply demonstrated in field experiments carried out throughout the United States and internationally." A copy of Mr. Thomas' letter is attached as Appendix B.

The United States Environmental Protection Agency Office of Air Quality Planning and Standards also expressed its support of Radian's Petition, stating that:

> The 915 MHz wind profiler is essential for activities requiring high resolution (100-meters) wind profiling in the lower atmospheric boundary layer - profilers that operate in the 400 MHz range, while useful for weather forecasting purposes, are considerably more expensive, and do not provide sufficient resolution for important air quality applications including, for example, evaluations involving ozone formation and transport.

Letter, dated June 15, 1993, from Desmond T. Bailey to FCC, a copy of which is attached hereto as Appendix C. Another letter of support was filed by Congressman J.J. Pickle of Texas, and is attached hereto as Appendix D.

Further maturation of this critical technology is in danger, however. The Commission must allow both LMS and 915 Wind Profilers to continue to develop in parallel and to accommodate each other for this critical environmental monitoring technology to survive. The FCC should give them opportunity to determine how to share the band effectively and economically. Allocation of LMS systems now, without consideration of 915 MHz Wind Profilers may establish licensing and technical operating parameters which may preclude future licensing of Wind Profilers in the same band. If the needs of both the LMS community and 915 MHz Wind Profilers are considered together now, however, licensing and technical operational issues can be resolved to the mutual benefit of both communities.

CONCLUSION

For the foregoing reasons, and those incorporated by reference from Radian's Petition, Comments and Reply Comments filed in ET Docket No. 93-59, Radian respectfully urges the Commission to allocate 12.5 MHz of spectrum in the 915 MHz band for the use of Wind Profilers.

Respectfully submitted,

Radian Corporation

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June 29, 1993

APPENDIX A

Before The

Federal Communications Commission

Washington, D.C. 20554

In The Matter Of	)	
	)	
Amendment of Section 2.106 of	)	ET Docket No. 93-59
the Commission's Rules to	)	RM-8092
Allocate Spectrum for	)	

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